Chapter 3

Source Measurement Techniques

Measurement Methods

- Method 18, Measurement of Gaseous Organic Compound Emissions by Gas Chromatography
- Method 25, Determination of Total Gaseous Non-Methane Organic Emissions as Carbon
- Method 25A, Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer

Method 18

- Sample is extracted from a single point at a rate proportional to gas velocity
- Organic components in the sample are separated by gas chromatography
- Separated compounds are analyzed with a suitable detector

Method 18 Applicability

- Suitable for measurement of about 90% of organics emitted by industrial processes
- Detection limit is about 1 ppmv
- Does not include techniques to identify and measure trace concentrations
- Will not determine compounds that are polymeric, can polymerize before analysis, or that have very low vapor pressure

Pre-Survey Sampling Techniques

- Evacuated or purged glass sampling flasks
- Flexible bags
- Adsorption tubes

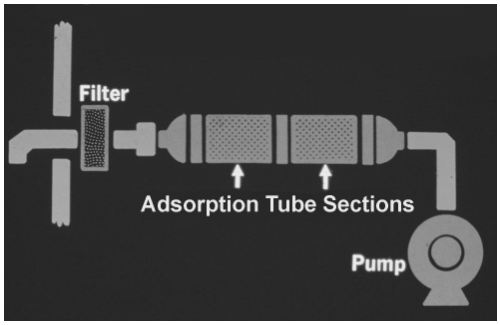
Final Sampling Techniques

- Direct interface
- Dilution interface
- Adsorption tubes
- Flexible bags

Direct or Dilution Interface Sampling

- Strengths
  - No loss or alteration of compounds
  - Method of choice when temperature is below 100°C and VOC concentrations are suitable
- Weaknesses
  - GC must be located at sampling site
  - Cannot sample proportionally or obtain time integrated sample

Adsorption Tube Sampling



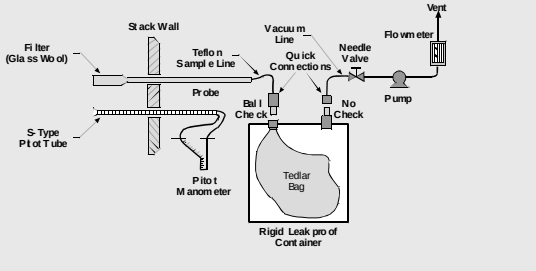
Adsorbent Media

- Activated carbon
- Silica gel
- Tenax
- XAD resin

Adsorption Tube Sampling

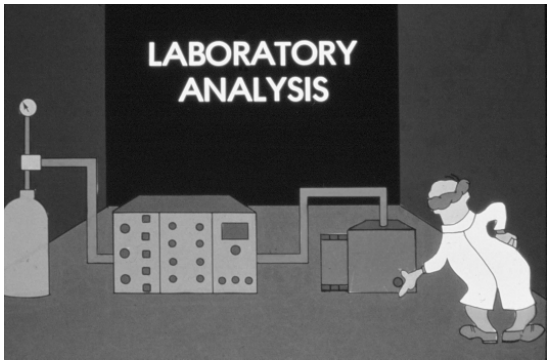
- Strengths
  - Samples are compact and easy to handle
  - Samples returned to lab for analysis
  - Can be stored up to a week at 0°C
- Weaknesses
  - Breakthrough capacity must be known
  - Effect of moisture must be known
  - Quantitative recovery of compounds must be known
  - Samples must be collected at a constant rate

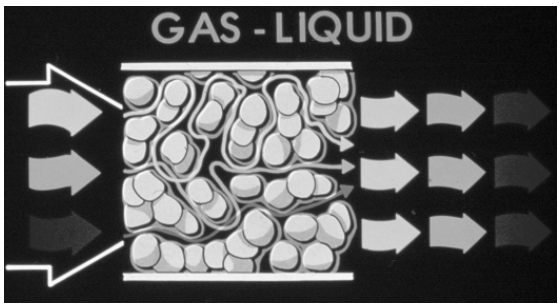
Flexible Bag Sampling



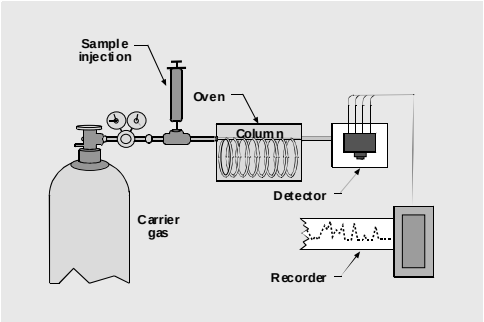
Flexible Bag Sampling

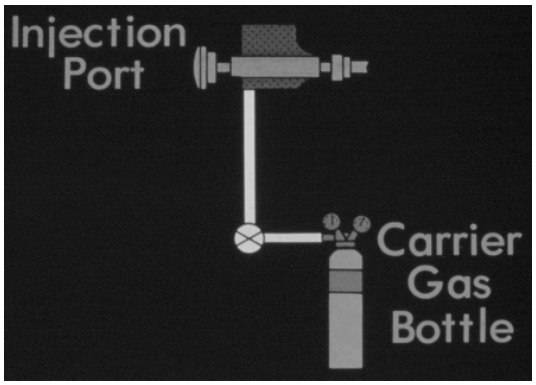
- Strengths
  - Samples approximate form in stack
  - Samples are returned to lab for analysis
  - Samples may be collected proportionally
- Weaknesses
  - Bags are awkward and bulky and prone to leaks
  - Compounds may adsorb onto bag surface
  - Compounds may react with bag surface or with each other
  - Storage time is generally less than 24 hours

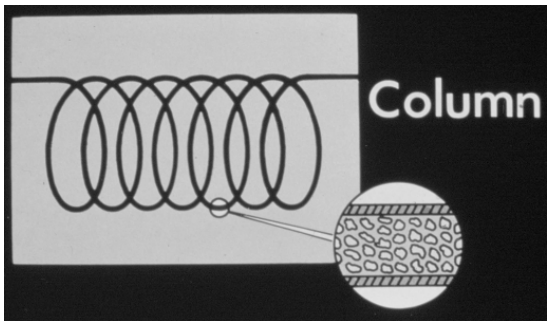


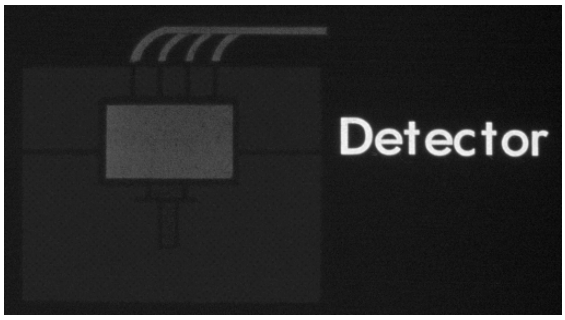


Gas Chromatographic System

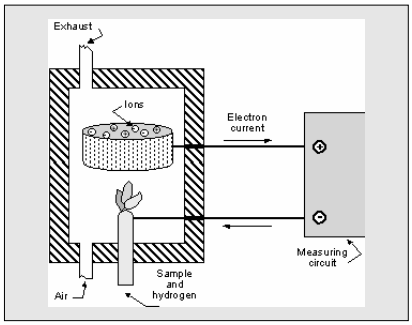



Injection
Port
Carrier
Gas
Bottle

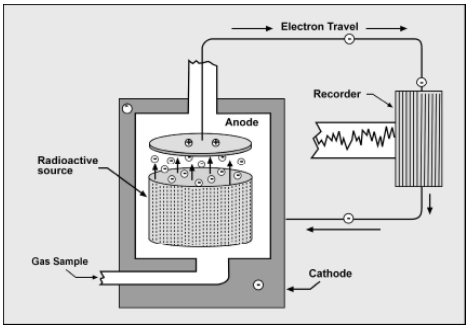

Column

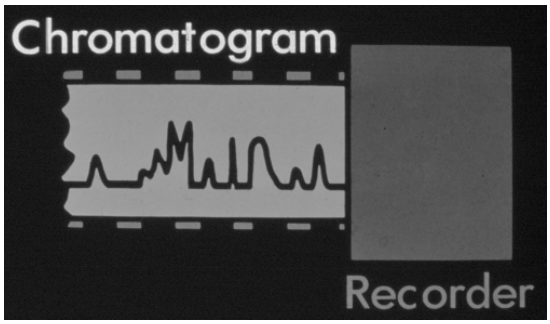

Detector

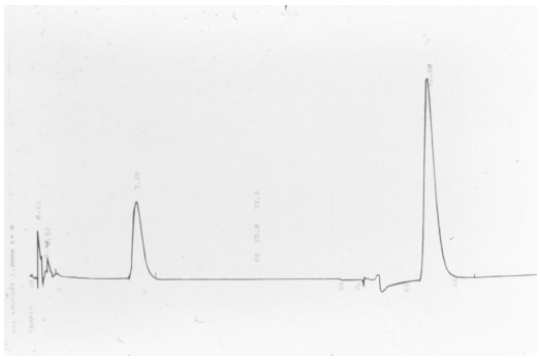
Flame Ionization Detector



Electron Capture Detector







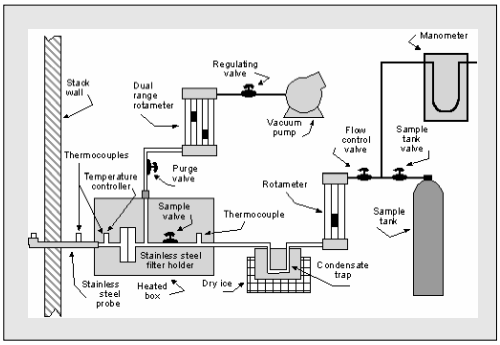
Method 25

- Sample is extracted from a single point at a rate proportional to gas velocity
- Sample is separated into condensable and non-condensable fractions
- Analysis yields total gaseous non-methane organic emissions as carbon

Method 25 Applicability

- Organic compounds which are a gas or have significant vapor pressure at or below 250°F
- Sources with concentrations of 50 ppmv to 5% by volume
- High concentrations of CO_2 and water vapor can cause interference at low concentrations

Method 25 Sampling Train



Method 25 Analysis

- Condensate trap is purged with zero air and purged gas is collected in the sample tank
- Condensed VOCs are volatilized, oxidized to CO_2, and collected in a second tank
- VOCs in the sample tank are separated with GC, oxidized to CO_2, reduced to methane and measured by FID
- CO_2 peak in second tank is measured and counted as VOCs
- Total VOCs is the sum of both analyses

Method 25A

- Measures total organic concentration on a continuous, real-time basis using an FID
- Method is best applied to the measurement of vapors consisting primarily of alkanes, alkenes or aromatic hydrocarbons
- Gives reduced response to compounds that are highly substituted or chlorinated

Method 25A Sampling Train